

Low-Weight, Durable, and Low-Cost Metal Rubber Sensor System for Ultra Long Duration Scientific Balloons, Phase I

Completed Technology Project (2011 - 2011)



Project Introduction

NanoSonic proposes to develop an innovative, low-cost, ultra low mass density, and non-intrusive sensor system for ultra long duration balloons (ULDB) that will operate in the most extreme environmental conditions. Specifically, the sensors would be integrated onto the load bearing seams and/or outer balloon mesh polyethylene surface of the pressurized balloon system to accurately and continually measure axial loads. Large axial load forces and extreme temperature ranges are typical for scientific balloon missions; therefore a durable, flexible, and thermally stable sensor material is needed. NanoSonic would use its highly flexible, low-modulus Metal Rubber

TM

(MR

TM

) materials as strain/pressure sensors that are capable of large cyclic deformation without failure. MR

TM

is a free-standing nanocomposite material produced by the layer-by-layer combination of high performance polymers and electrically-conducting metal nanoparticles that provide durability and recoverability for sensor transduction, and a wide thermal operation range. Importantly, MR

TM

can behave like a rubber band in that it can be folded / compressed for stowage and then can be deployed and continually pressurized without failure. Also, because of the very low amount of metallic nanoclusters in the system (<0.02 volume %), the sensor system is extremely low-weight and would not alter the performance of the balloon.



Low-Weight, Durable, and Low-Cost Metal Rubber Sensor System for Ultra Long Duration Scientific Balloons, Phase I

Table of Contents

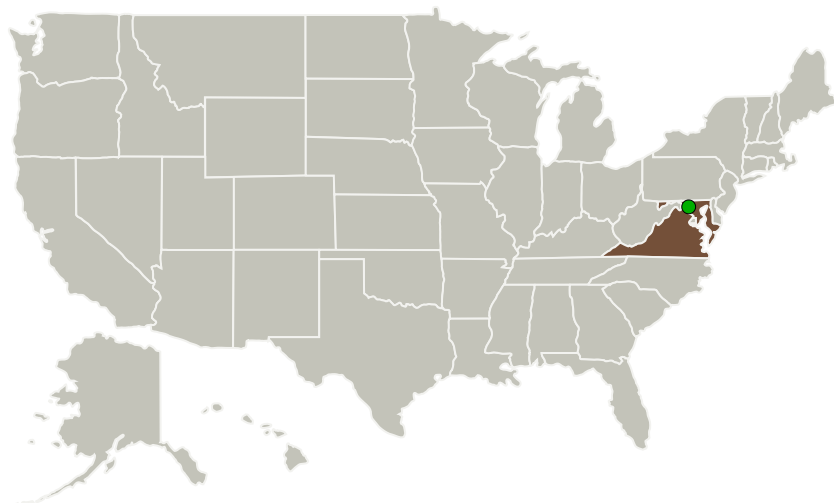
Project Introduction	1
Primary U.S. Work Locations and Key Partners	2
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

Low-Weight, Durable, and Low-Cost Metal Rubber Sensor System for Ultra Long Duration Scientific Balloons, Phase I

Completed Technology Project (2011 - 2011)



Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Nanosonic, Inc.	Lead Organization	Industry	Pembroke, Virginia
● Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations

Maryland	Virginia
----------	----------

Project Transitions

February 2011: Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Nanosonic, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

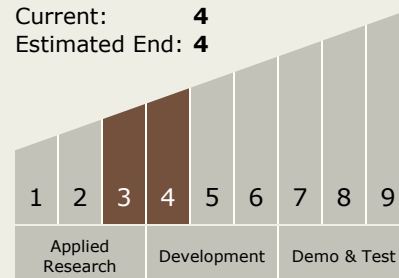
Carlos Torrez

Principal Investigator:

A. Hill

Technology Maturity (TRL)

Start: **3**
 Current: **4**
 Estimated End: **4**



Low-Weight, Durable, and Low-Cost Metal Rubber Sensor System for Ultra Long Duration Scientific Balloons, Phase I

Completed Technology Project (2011 - 2011)



✓ September 2011: Closed out

Closeout Summary: Low-Weight, Durable, and Low-Cost Metal Rubber Sensor System for Ultra Long Duration Scientific Balloons, Phase I Project Image Low-Weight, Durable, and Low-Cost Metal Rubber Sensor System for Ultra Long Duration Scientific Balloons, Phase I

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/138281>)

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.3 Mechanical Systems
 - └ TX12.3.4 Reliability, Life Assessment, and Health Monitoring

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System